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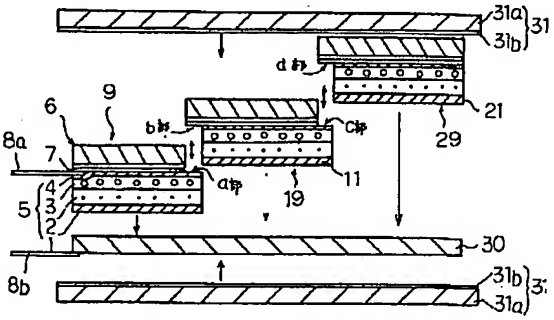
(54)【発明の名称】　電界発光灯

(57)【要約】　（修正有）

【課題】　電界発光灯を屋外照明や看板、道路標識等に使用する場合大型化を必要とするが、一つの素子では困難なのでそれに対する対応策の提供。

【解決手段】　裏面電極１上に反射絶縁層２、発光層３、透明導電層４を順次印刷し積層シート５を形成する。次に透明電極フィルム６に集電帯７を印刷形成、集電帯７からリード電極８ａを導出する。次に、シート５の透明電極層のａ部が露出するようにフィルム６を透明電極層４上に熱圧着で貼りつけ発光素子９を得る。次に、シート５と同様のシートの上に透明導電フィルの上に集電帯を形成したものの一端をはみ出して形成、発光素子１９を得る。同様に素子２９を得る。電極８ｂを導出したアルミ箔からなる導電シート３０上に素子９，１９，２９の裏面電極側を隣接配置し、かつ素子の露出部ａ，ｃと導電フィルムの食み出し部ｂ，ｄとが電気的に接続するように配し、外皮フィルム３１で上下から熱圧着する。



【特許請求の範囲】
【請求項１】裏面電極上に反射絶縁層、発光層、透明導電層が順次印刷形成され、該透明導電層の上に透明導電層の端部を露出させて透明導電フィルムが配設された電界発光素子と、裏面電極上に反射絶縁層、発光層、透明導電層が順次印刷形成され、該透明導電層の上に透明導電フィルムの端部を食み出して配設した電界発光素子とを有し、前記透明導電層の露出部と前記透明導電フィルムの食み出し部とを接続して複数の電界発光素子を隣接配置すると共に、前記複数の電界発光素子の裏面電極を導電シートに接続した電界発光灯。
【請求項２】裏面電極上に裏面電極の端部を露出させて反射絶縁層、発光層、透明導電層が順次印刷形成され、該透明導電層の上に透明導電層の端部を露出させて透明導電フィルムが配設された電界発光素子と、裏面電極上に反射絶縁層、発光層、透明導電層が順次印刷形成され、該透明導電層の上に透明導電フィルムの端部を食み出して配設した電界発光素子とを有し、前記透明導電層の露出部と前記透明導電フィルムの食み出し部とを接続して複数の電界発光素子を隣接配置すると共に、前記複数の電界発光素子の裏面電極を裏面電極の露出部で重合接続した電界発光灯。
【請求項３】電界発光素子の透明導電フィルムに集電帯が形成されており、隣接する電界発光素子の透明導電層の露出部と透明導電フィルムの食み出し部とが前記集電帯を介して電気的に接続されていることを特徴とする請求項１または請求項２に記載の電界発光灯。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は電界発光灯に関し、特に大型化に対応するため多数個の電界発光灯を配列してなる電界発光灯に関するものである。
【０００２】
【従来の技術】従来、電界発光灯８０は、図７の要部拡大断面図に示すように、アルミ箔等からなる裏面電極８１上に反射絶縁層８２、発光層８３を順次積層印刷し、透明フィルム８４ａ上に透明電極８４ｂを形成した透明導電フィルム８４を熱圧着で発光層８２に貼り付けて形成した電界発光素子８５を上下から外皮フィルム８６で封止した構造が一般的である。
【０００３】ここで、電界発光灯を屋外照明や看板、道路標識等に使用する場合、大型化が必要となる。しかし、一つの素子で大型化するには非常に大型の設備が必要となり、量産レベルでは対応が困難であるため、一般的には図８（ａ）に示すように外皮フィルムで封止された個々の電界発光灯８０，８０，８０を並べたり、あるいは、図８（ｂ）に示すように個々の電界発光素子８５，８５，８５を並べて全体を上下から１つの外皮フィルム８６で封止して対応していた。
【０００４】
【発明が解決しようとする課題】しかし、前記構造では個々の電界発光灯に給電が必要で配線が複雑となる、個々の電界発光灯のつなぎ目が不発光部となる等の問題があった。そこで、これらの問題を解決するため、実開平６－５０２９４号公報では印刷による透明導電層を設けた電界発光素子の透明導電層ともう一つの電界発光素子の裏面電極を端部で積層して電気的に接続し、給電のための配線を簡素化し、つなぎ目の不発光部をなくした例が開示されている。しかし、この方法では積層部分の厚みが局部的に厚くなるという問題がある。また、透明電極に比較的抵抗値の高い透明導電印刷層も用いているため大型化すると輝度むらが生じ、大型化には限界があるという問題がある。
【０００５】
【課題を解決するための手段】本発明は上記課題を解決し、小型の電界発光灯を並べて接続することによって、容易に製造できる大型の電界発光灯を提供することを目的として提案されたもので、本発明の電界発光灯は裏面電極上に反射絶縁層、発光層、透明導電層が順次印刷形成され、該透明導電層の上に透明導電層の端部を露出させて透明導電フィルムが配設された電界発光素子と、裏面電極上に反射絶縁層、発光層、透明導電層が順次印刷形成され、該透明導電層の上に透明導電フィルムの端部を食み出して配設した電界発光素子とを有し、前記透明導電層の露出部と前記透明導電フィルムの食み出し部とを接続して複数の電界発光素子を隣接配置すると共に、前記複数の電界発光素子の裏面電極を導電シートに接続してなることを特徴とする。
【０００６】また、裏面電極上に裏面電極の端部を露出させて反射絶縁層、発光層、透明導電層が順次印刷形成され、該透明導電層の上に透明導電層の端部を露出させて透明導電フィルムが配設された電界発光素子と、裏面電極上に反射絶縁層、発光層、透明導電層が順次印刷形成され、該透明導電層の上に透明導電フィルムの端部を食み出して配設した電界発光素子とを有し、前記透明導電層の露出部と前記透明導電フィルムの食み出し部とを接続して複数の電界発光素子を隣接配置すると共に、前記複数の電界発光素子の裏面電極を裏面電極の露出部で重合接続したことを特徴とする。
【０００７】また、電界発光素子の透明導電フィルムに集電帯が形成されており、隣接する電界発光素子の透明導電層の露出部と透明導電フィルムの食み出し部とが前記集電帯を介して電気的に接続されていることを特徴とする。
【０００８】本発明によれば、隣接する電界発光素子の一方の素子の透明導電層に他方の素子の透明導電フィルムを積層する構造であるため、薄型かつ大型で、つなぎ目の不発光部のない電界発光灯を提供できる。また、表面側の電極が透明導電フィルムに形成された透明電極と、発光層上に印刷された透明導電層との２層構造にな

っているので、断線や輝度偏差のない信頼性の高い電界発光灯を提供できる。さらに、隣接する電界発光素子の一方の透明導電層と他方の透明導電フィルムの透明電極とが集電帯を介して接続される箇所があるので電界発光素子間の導通が一層確実となり、さらに信頼性が向上する。

【0009】

【発明の実施の形態】本発明の電界発光灯の第一の実施例について図1、図2、図3を参照しながら説明する。本発明の大型化した電界発光灯35は図1（a）の断面図及び図1（b）の平面図に示すような構造をしている。その製造方法を図2を用いて説明する。まず、図2（a）の断面図に示すようにアルミ箔等からなる裏面電極1上にチタン酸バリウム等の白色高誘電体物を樹脂中に分散させた反射絶縁層2、硫化亜鉛を銅で付活した蛍光体を樹脂中に分散した発光層3、酸化インジウム等の透明導電粉末を熱可塑性の樹脂に分散させた透明導電層4を順次印刷し、積層シート5を形成する。次に透明フィルム6aにITOなどの透明電極6bを蒸着形成した透明導電フィルム6の透明電極6b上の所定の箇所に銀ペースト等からなる集電帯7を印刷形成し、集電帯7からリード電極8aを導出する。次に、積層シート5の透明導電層4の端部a部が露出するように透明導電フィルム6を透明導電層4上に熱圧着で貼り付け、電界発光素子9を得る。

【0010】次に図2（b）の断面図に示すように別のアルミ箔等からなる裏面電極11上にチタン酸バリウム等の白色高誘電体物を樹脂中に分散させた反射絶縁層12、硫化亜鉛を銅で付活した蛍光体を樹脂中に分散した発光層13、酸化インジウム等の透明導電粉末を熱可塑性の樹脂に分散させた透明導電層14を順次印刷し、積層シート15を形成する。次に透明フィルム16a上にITOなどの透明電極16bを蒸着形成した透明導電フィルム16の透明電極16b上の所定の箇所に銀ペースト等かなる集電帯17を印刷形成し、透明導電フィルム16のb部及び積層シート15の透明導電層14の端部cが露出するように透明導電フィルム16を透明導電層14上に位置をずらして熱圧着で貼り付け、電界発光素子19を得る。

【0011】次に、図2（c）の断面図に示すように別のアルミ箔等からなる裏面電極21上にチタン酸バリウム等の白色高誘電体物を樹脂中に分散させた反射絶縁層22、硫化亜鉛を銅で付活した蛍光体を樹脂中に分散した発光層23、酸化インジウム等の透明導電粉末を熱可塑性の樹脂に分散させた透明導電層24を順次印刷し、積層シート25を形成する。次に透明フィルム26a上にITO等の透明電極26bを蒸着形成した透明導電フィルム26の透明電極26b上の所定の箇所に銀ペースト等からなる集電帯27を印刷形成し、透明導電フィルム26のd部が露出するように食み出させて透明導電フィルム26を透明導電層24上に熱圧着で貼り付け、電界発光素子29を得る。

【0012】次に、図3の断面図に示すようにリード電極8bを導出したアルミ箔等からなる導電シート30の上に前記の各電界発光素子9，19，29の裏面電極1，11，21が電気的に接続し、かつ電界発光素子9のa部と電界発光素子19のb部、電界発光素子19のc部と電界発光素子29のd部が電気的に接続するように配置し、透明フィルム31a上に熱可塑性の接着層31bを形成した外皮フィルム31で上下から熱圧着で封止し大型の電界発光灯35を得る。

【0013】ここで、それぞれの電界発光素子9，19，29の発光層3，13，23の上には印刷された透明導電層4，14，24が配置されているため、これらの透明導電層と集電帯7，17，27を介して3つの電界発光素子9，19，29の透明電極6b，16b，26bを接続することができ、1つのリード電極で同時に3つの電界発光素子に給電することができる。また、電界発光素子のつなぎ目に段差ができず、透明電極のつなぎ目に隙間が生じても集電帯7，17，27と発光層上の透明導電層4，14，24によって発光層3，13，23に電界が印加されるため不発光部が生じることもない。

【0014】また、一般的な製造装置で製造可能な1つの電界発光素子の最大のサイズを仮にA3サイズとすると本実施例ではA3サイズの3倍の大型電界発光灯を容易に製造することができる。本実施例では3つの電界発光灯を接続した例について説明したが、さらに多数の電界発光素子を同時に接続することによってさらに大型の電界発光灯を実現することができる。

【0015】次に本発明の第二実施例について説明する。第一実施例では各電界発光素子のの各裏面電極の接続はリード電極を取り付けた導電シート30によってなされていたが、第二実施例ではこれらのシートを簡略化した例について説明する。

【0016】図4は本発明の第二実施例を示す電界発光灯70の断面図である。その製造方法を図5を用いて説明する。まず、図5（a）の断面図に示すようにアルミ箔等からなる裏面電極41上に裏面電極41の端部にe部を残して反射絶縁層42、発光層43、透明導電層44を順次印刷し、積層シート45を形成し、裏面電極41からリード電極48bを導出する。次に透明フィルム46a上に透明電極46bを形成した透明導電フィルム46の透明電極46b上の所定の箇所に集電帯47を印刷形成し、集電帯47からリード電極48aを導出する。次に、積層シート45の透明導電層44の端部にf部が露出するように透明導電フィルム46を透明導電層44上に熱圧着で貼り付け、電界発光素子49を得る。

【0017】次に、別の裏面電極51上に裏面電極51の端部にg部を残して反射絶縁層52、発光層53、透

明導電層５４を順次印刷し、積層シート５５を形成する。次に透明フィルム５６ａ上に透明電極５６ｂを形成した透明導電フィルム５６の透明電極５６ｂ上の所定の箇所に集電帯５７を印刷形成し、透明導電フィルム５６の端部のｈ部及び積層シート５５の透明導電層５４の端部のｉ部が露出するように透明導電フィルム５６を位置をずらして透明導電層５４上に熱圧着で貼り付け、電界発光素子５９を得る。

【００１８】さらに、別の裏面電極６１上に反射絶縁層６２、発光層６３、透明導電層６４を順次印刷し、積層シート６５を形成する。次に透明フィルム６６ａ上に透明電極６６ｂを形成した透明導電フィルム６６の透明電極６６ｂ上の所定の箇所に集電帯６７を印刷形成し、透明導電フィルム６６の端部にｊ部が露出するように透明導電フィルム６６を透明導電層６４上に熱圧着で貼り付け、電界発光素子６９を得る。

【００１９】次に、図６の断面図に示すように電界発光素子４９，５９，６９の裏面電極４１，５１，６１がｅ部とｇ部で当接されて電気的に接続し、かつ電界発光素子４９のｆ部と電界発光素子５９のｈ部、電界発光素子５９のｉ部と電界発光素子６９のｊ部が電気的に接続するよう配置し、透明フィルム７１ａ上に熱可塑性の接着層７１ｂを形成した外皮フィルム７１で上下から熱圧着で封止し電界発光灯７０を得る。本実施例によると、実施例１に比べて基盤の導電シート３０を削減できることから、厚みを薄くでき、また工数低減によりコスト低減が図れる。

【００２０】また、本実施例ではリード電極の導出方向に平行な縦方向に複数の電界発光灯を接続した例について説明したが、リード電極の導出方向と垂直な横方向にも接続は可能で、縦横両方向への拡大も可能である。

【００２１】

【発明の効果】本発明によれば隣接する電界発光素子の一方の素子の透明導電層に他方の素子の透明導電フィルムを積層する構造であるため、薄型かつつなぎ目の不発光部がない大型の電界発光灯を、大掛かりな設備を用いることなく、容易に提供できる。また、表面側の電極が透明導電フィルムの透明電極と透明導電層の２層構造となっているため、また、透明電極と透明導電層が集電帯を介して接続している箇所があるので電気的接続が確実となり、大型化しても断線や輝度偏差がない信頼性の高い大型の電界発光灯を提供できる。

【図面の簡単な説明】

【図１】　本発明の第１実施例の電界発光灯のＡ－Ａ線断面図及び平面図

【図２】　本発明の第１実施例の電界発光灯に使用する各電界発光素子の構造と製造工程を説明する図

【図３】　本発明の第１実施例の電界発光灯の組立図

【図４】　本発明の第２実施例の電界発光灯の断面図

【図５】　本発明の第２実施例の電界発光灯に使用する各電界発光素子の構造と製造工程を説明する図

【図６】　本発明の第２実施例の電界発光灯の組立図

【図７】　従来の電界発光灯の断面図

【図８】　従来の大型化した電界発光灯の平面図

【符号の説明】

１，１１，２１，４１，５１，６１　裏面電極

２，１２，２２，４２，５２，６２　反射絶縁層

３，１３，２３，４３，５３，６３　発光層

４，１４，２４，４４，５４，６４　透明導電層

６，１６，２６，４６，５６，６６　透明導電フィルム

６ａ，１６ａ，２６ａ，４６ａ，５６ａ，６６ａ　透明フィルム

６ｂ，１６ｂ，２６ｂ，４６ｂ，５６ｂ，６６ｂ　透明電極

７，１７，２７，４７，５７，６７　集電帯

８ａ，８ｂ　リード電極

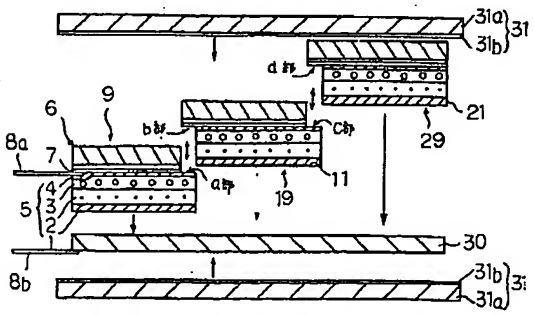
９，１９，２９　電界発光素子

３０　導電シート

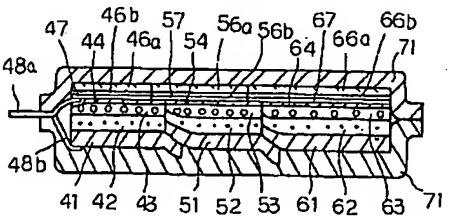
３１，７１　外皮フィルム

３５　電界発光灯

【図３】



【図４】



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(54) Name of the invention:

Electroluminescent Lamp

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(71) Patent Assignee: NEC Kansai LTD.

JP 10-208877

[Note: Names, addresses, company names and brand names are translated in the most common manner. Japanese language does not have singular or plural words unless otherwise specified by a numeral prefix or a general form of plurality suffix.]

(54) [Name of the Invention]

Electroluminescent Lamp

(57) [Abstract]

(There is an amendment.)

[Problems to be Solved by the Invention]

In the case when the electroluminescent lamp is used for outdoor illumination, or signboards, road signs etc., a large scale is needed, however, this is difficult to achieve by using a single element and the topic of the present invention is to suggest a countermeasure relative to that.

[Means to Solve the Problem]

The reflective insulating layer 2, the luminescent (light-generating) layer 3, the transparent conducting layer 4, are successively printed on the back surface electrode 1 and the laminated layer sheet 5 is formed. After that electricity-collecting band 7 is printed and formed on the transparent electrode film 6 and the lead electrode 8a is brought out from the electricity-collecting band 7. After that, the film 6 is glued by thermal and pressure bonding on the surface of the transparent electrode layer 4 so that the part a of the transparent electrode layer of the sheet 5 is exposed and the luminescent element 9 is obtained. Next, the luminescent element 19 is formed as one edge of a material, which has been formed as an electricity-collecting band has been formed on a transparent electroconductive fill on the surface of a sheet that is the same as the sheet 5, is protruding. The element 29 is formed the same way. On the electroconductive sheet 30 that is formed from an aluminum foil from which the electrode 8 b is brought out the back surface electrode side of the elements 9, 19 and 29, are placed so that they are adjacent and also, they are placed so that the exposed parts a and c of the elements and the brought out parts b, d of the electroconductive film are electrically connected, and through an outside cover film 31 heat and pressure is applied from the top and the bottom direction and these are bonded.

[Scope of the Claims]

[Claim 1]

Electroluminescent lamp that consists of a electroluminescent element, where a reflective insulating layer, luminescent layer, a transparent conducting layer, are successively printed on the back surface electrode and on the surface of the above transparent electroconductive layer a transparent electroconductive film is placed so that the edge part of the transparent electroconductive layer is exposed, and of a electroluminescent element where a reflective insulating layer, luminescent layer, a transparent conducting layer, are successively printed on the back surface electrode and on the surface of the above transparent electroconductive layer a transparent electroconductive film is placed so that the edge part of the transparent electroconductive layer is brought out, and the above described exposed part of the transparent electroconductive layer and the above described brought out part of the transparent electroconductive film are joined and multiple number of electroluminescent elements are placed so they are adjacent to each other and together with that the back surface electrodes of the above described multiple number of electroluminescent elements are connected to the electroconductive sheet(s).

[Claim 2]

Electroluminescent lamp that consists of a electroluminescent element, where a reflective insulating layer, luminescent layer, a transparent conducting layer, are successively printed on the back surface electrode so that the edge part of the back surface electrode is exposed and on the surface of the above transparent electroconductive layer a transparent electroconductive film is placed so that the edge part of the transparent electroconductive layer is exposed, and of a electroluminescent element where a reflective insulating layer, luminescent layer, a transparent conducting layer, are successively printed on the back surface electrode and on the surface of the above transparent electroconductive layer a transparent electroconductive film is placed so that the edge part of the transparent electroconductive layer is brought out, and the above described exposed part of the transparent electroconductive layer and the above described brought out part of the transparent electroconductive film are joined and multiple number of electroluminescent elements are placed so they are adjacent to each other and together with that the back surface electrodes of the above described multiple number of electroluminescent elements are connected by the stacking of the exposed parts of the back surface electrodes.

[Claim 3]

Electroluminescent lamp according to the above reported Claim paragraph 1 or Claim paragraph 2 characterized by the fact that an electricity-collecting band is formed on the transparent electroconductive film of the electroluminescent elements, and the exposed part of the transparent electroconductive layer of the adjacent electroluminescent elements and the brought out part of the transparent electroconductive film of the adjacent electroluminescent elements are electrically connected through the above described electricity-collecting band.

[Detailed Explanation of the Invention]

[0001]

[Technological Field of the Invention]

The present invention is an invention about an electroluminescent lamp, and especially it is an invention about an electroluminescent lamp that consists of an array of multiple individual electroluminescent lamps in order to respond to the large size scale requirements.

[0002]

[Prior Art]

In the past, usually, the electroluminescent lamps 80, as shown according to the presented in Figure 7 enlarged cross sectional view of its essential parts, had a structure where on the back surface electrode 81 formed from aluminum foil etc., the reflective insulation layer 82 and the luminescent layer 83 are successively laminated as layers by printing, and a transparent electroconductive layer 84, which has been formed as a transparent electrode 84b has been formed on a transparent film 84a, is adhered onto the luminescent layer 82 by bonding applying heat and pressure (thermobonding) and the formed electroluminescent element 85 was sealed on the top and the bottom by the outer cover film 86.

[0003]

Then in the case when the electroluminescent lamps are used for outdoor illumination or signboards, road signs etc., a large scale is required. However, achieving a large scale implementation using a single element requires an extremely large scale installation, and the production level response is difficult and because of that usually, the response has been that the as shown according to Figure 8 (a), individual electroluminescent lamps 80, 80, 80 that have been sealed by the cover film, are arranged or as shown according to Figure 8 (b) the whole body of the arranged individual electroluminescent lamps 85, 85, 85 is sealed from the top and the bottom by one outer cover film 86.

[0004]

[Problems to be Solved by the Invention]

However in the case of the above described structure, electricity supply is required for each individual electroluminescent lamp and because of that the wiring becomes complex, and there have been problems like the problem that the joint endings of the individual electroluminescent lamps become parts that do not generate light, etc. Then, in order to solve these problems according to the description reported in the Japanese Patent Application Laid Open Number Hei-Sei 6-50294, an example has been disclosed where

the transparent electroconductive layer of a electroluminescent lamp that has been provided with a transparent electroconductive layer through printing, and the back surface electrode of another electroluminescent lamp are electrically connected through layer lamination at the edges, and the wiring in order to supply electricity is simplified and the joint parts are not parts that do not generate light. However, according to this method, there is the problem that the thickness of the laminated layer part becomes locally thick. Also, because of the fact that for the transparent electrodes transparent electroconductive printed layers with relatively high resistance value are used, when a large size scale is produced brightness variations are generated, and there has been the problem that it is said that this is a limitation with respect to large size scale applications.

[0005]

[Measures to Solve the Problems]

In order to solve the above-described problems, the present invention is a suggestion with the goal to suggest a large-scale electroluminescent lamp that can be easily manufactured, through the arrangement and connection of small-scale electroluminescent lamps. And because of that the electroluminescent lamp according to the present invention is characterized by the fact that it is a electroluminescent lamp that consists of a electroluminescent element, where a reflective insulating layer, luminescent layer, a transparent conducting layer, are successively printed on the back surface electrode and on the surface of the above transparent electroconductive layer a transparent electroconductive film is placed so that the edge part of the transparent electroconductive layer is exposed, and of a electroluminescent element where a reflective insulating layer, luminescent layer, a transparent conducting layer, are successively printed on the back surface electrode and on the surface of the above transparent electroconductive layer a transparent electroconductive film is placed so that the edge part of the transparent electroconductive layer is brought out, and the above described exposed part of the transparent electroconductive layer and the above described brought out part of the transparent electroconductive film are joined and multiple number of electroluminescent elements are placed so they are adjacent to each other and together with that the back surface electrodes of the above described multiple number of electroluminescent elements are connected to the electroconductive sheet(s).

[0006]

Also, the electroluminescent lamp according to the present invention is characterized by the fact that it is a electroluminescent lamp that consists of a electroluminescent element, where a reflective insulating layer, luminescent layer, a transparent conducting layer, are successively printed on the back surface electrode so that the edge part of the back surface electrode is exposed and on the surface of the above transparent electroconductive layer a transparent electroconductive film is placed so that the edge part of the transparent electroconductive layer is exposed, and of a electroluminescent element where a reflective insulating layer, luminescent layer, a transparent conducting layer, are successively printed on the back surface electrode and on the surface of the

above transparent electroconductive layer a transparent electroconductive film is placed so that the edge part of the transparent electroconductive layer is brought out, and the above described exposed part of the transparent electroconductive layer and the above described brought out part of the transparent electroconductive film are joined and multiple number electroluminescent elements are placed so they are adjacent to each other and together with that the back surface electrodes of the above described multiple number of electroluminescent elements are connected by the stacking of the exposed parts of the back surface electrodes.

[0007]

Also, the electroluminescent lamp according to the present invention is characterized by the fact that an electricity-collecting band is formed on the transparent electroconductive film of the electroluminescent elements, and the exposed part of the transparent electroconductive layer of the adjacent electroluminescent elements and the brought out part of the transparent electroconductive film of the adjacent electroluminescent elements are electrically connected through the above described electricity-collecting band.

[0008]

According to the present invention, it has a structure where on the transparent electroconductive layer of one element of the adjacent electroluminescent elements the transparent electroconductive film of the other element is layer laminated, and because of that it is possible to suggest an electroluminescent lamp that is thin and also has a large scale and whose joint parts are not parts that do not generate light. Also, because of the fact that that it becomes a two-layer structure consisting of the transparent electrodes where the electrodes have been formed on the front surface side of a transparent electroconductive film, and of the transparent electroconductive layer that has been printed on the luminescent layer, it is possible to suggest an electroluminescent lamp with high reliability properties where there is no wire breaks or brightness variations. Then, furthermore, because of the fact that the transparent electroconductive layer of one of the adjacent electroluminescent elements and the transparent electrode of the transparent electroconductive film of the other element are connected through the electricity-collecting band, a simplification is achieved and because of that the connection between the electroluminescent elements becomes even more reliable thus improving the reliability.

[0009]

[Embodiment of the Invention]

One practical embodiment of the electroluminescent lamp according to the present invention will be explained as the diagrams in Figure1, Figure 2 and Figure 3 are elucidated. The large-scale electroluminescent lamp 35 according to the present invention has a structure as shown in the cross sectional view diagram in Figure 1 (a) and in the top view diagram presented in Figure 1 (b). Its manufacturing method is explained by using

Figure 2. First, as it is shown in the cross sectional diagram presented in Figure 2 (a), on the back surface electrode 1 formed from aluminum foil etc., the reflective insulation layer 2, obtained as barium titanate etc., white color highly dielectric material has been dispersed in a resin material, and the luminescent layer 3, obtained as a fluorescent material where copper has been adhered on zinc sulfate thereby activating it, has been dispersed in a resin material, and the transparent electroconductive layer 4, obtained as indium oxide etc., transparent electroconductive powder material is dispersed in a thermoplastic resin material, are successively printed, and the laminated layer sheet 5 is formed. After that, on predetermined locations on the transparent electrode 6b of the transparent electroconductive film 6, obtained as ITO, etc., transparent electrodes 6b are formed through vapor deposition on a transparent film 6a, the electricity-collecting band 7 consisting of silver paste etc., is printed and formed, and the lead electrode 8a is brought out from the electricity-collecting band. Next, the transparent electroconductive film 6 is adhered, through heat and pressure bonding, onto the transparent electroconductive layer 4 so that the a part of the edge of the transparent electroconductive layer 4 of the layer laminated sheet 5 is exposed, and the electroluminescent element 9 is obtained.

[0010]

Next, as it is shown according to the cross sectional view diagram shown in Figure 2 (b) on another back surface electrode 11 formed from aluminum foil etc., the reflective insulation layer 12, obtained as barium titanate etc., white color highly dielectric material has been dispersed in a resin material, and the luminescent layer 13, obtained as a fluorescent material where copper has been adhered on zinc sulfate thereby activating it, has been dispersed in a resin material, and the transparent electroconductive layer 14, obtained as indium oxide etc., transparent electroconductive powder material is dispersed in a thermoplastic resin material, are successively printed, and the laminated layer sheet 15 is formed. After that, on predetermined locations on the transparent electrode 16b of the transparent electroconductive film 16, obtained as ITO, etc., transparent electrodes 16b are formed through vapor deposition on a transparent film 16a, the electricity-collecting band 17 consisting of silver paste etc., is printed and formed, and the transparent electroconductive film 16 is moved to a position on the transparent electroconductive layer 14 and it is adhered, through heat and pressure bonding, so that the part b of the transparent electroconductive film 16 and the part c of the transparent electroconductive layer 14 of the laminated sheet 15 are exposed, and the electroluminescent element 19 is obtained.

[0011]

As it is shown according to the cross sectional view diagram presented in Figure 2 ©, on another back surface electrode 21 formed from aluminum foil etc., the reflective insulation layer 22, obtained as barium titanate etc., white color highly dielectric material has been dispersed in a resin material, and the luminescent layer 23, obtained as a fluorescent material where copper has been adhered on zinc sulfate thereby activating it, has been dispersed in a resin material, and the transparent electroconductive layer 24,

obtained as indium oxide etc., transparent electroconductive powder material is dispersed in a thermoplastic resin material, are successively printed, and the laminated layer sheet 25 is formed. After that on predetermined locations on the transparent electrode 26b of the transparent electroconductive film 26, obtained as ITO, etc., transparent electrodes 26b are formed through vapor deposition on a transparent film 26a, the electricity-collecting band 27 consisting of silver paste etc., is printed and formed, and the transparent electroconductive film 26 is adhered through heat and pressure bonding onto the transparent electroconductive layer 24, so that the part d of the transparent electroconductive film 26 is exposed and it sticks out, and the electroluminescent element 29, is obtained.

[0012]

Then, after that, as it is shown according to the cross sectional view diagram in Figure 3, the back surface electrodes 1, 11, 21 of each of the above described electroluminescent elements 9, 19 and 29, are electrically connected on the surface of the electroconductive sheet 30, which is made of the aluminum foil etc., and from which the lead electrode 8b is brought out, and also, the part a of the electroluminescent element 9 and the part b of the electroluminescent element 19, and the part c of the electroluminescent element 19 and the part d of the electroluminescent element 29 are placed so that they are electrically connected, and by using the outer cover film 31, which is formed as the thermoplastic resin layer 31 b has been formed on the surface of the transparent film 31 a, this is sealed from the top and the bottom side by heat and pressure bonding, and the large scale electroluminescent lamp 35 is obtained.

[0013]

Here, on the luminescent layers 3, 13, and 23 of the corresponding electroluminescent elements 9, 19 and 29, the printed transparent electroconductive layers 4, 14 and 24, have been placed, and because of that these transparent electroconductive layers can be connected to the transparent electrodes 6b, 16b and 26 b of the three electroluminescent elements 9, 19 and 29, through the electricity-collecting bands 7, 17 and 27; and it is possible to supply electricity to the three electroluminescent elements at the same time through a single lead electrode. Also, there are no steps at the connecting parts of the electroluminescent elements, and even if gaps are generated at the connecting parts of the transparent electrodes, through the electricity-collecting bands 7, 17 and 27 and the transparent electroconductive layers 4, 14 and 24 on the surface of the electroluminescent layers, an electrical field is applied onto the electroluminescent layers 3, 13 and 23, and because of that, there is also no generation of parts that do not generate light.

[0014]

Also, if the maximum size of a single electroluminescent element that can be manufactured by using the usual manufacturing equipment is designated temporarily as A3 size, according to this practical embodiment example, it is possible to easily manufacture a large-scale electroluminescent lamp whose size is three times the 3A size.

In the case of the present practical implementation example, an explanation was provided where three electroluminescent lamps were connected, however, by connecting at the same time a large number of electroluminescent elements, then it is possible to practically realize a large scale electroluminescent lamp.

[0015]

After that, a second practical embodiment example according to the present invention will be explained. In the case of the first practical example, the connection between each of the electroluminescent elements and each of the back surface electrodes was accomplished through the electroconductive sheet 30 that has been provided with a lead electrode, however, according to the second practical implementation example an explanation will be provided regarding an example for the simplification of this sheet.

[0016]

Figure 14 represents a sectional view diagram of the electroluminescent lamp 70 that shows the second practical implementation example according to the present invention. Its manufacturing method is explained by using Figure 5. First, as it is shown according to the presented in Figure 5 (a), on the surface of the back surface electrode 41 formed from aluminum foil etc., the reflective insulation layer 42, the electroluminescent layer 43 and the transparent electroconductive layer 44 are successively printed so that the edge part e of the back surface electrode 41 remains, and the layer laminated sheet 45 is formed, and the lead electrode 48 b is brought out from the back surface electrode 41. Next, at predetermined locations on the transparent electrode 46b of the transparent electroconductive film 46 formed as the transparent electrodes 46 b have been formed on the transparent film 46a, the electricity-collecting band 47 is printed, and from the electricity-collecting band 47 the lead electrode 48 a is brought out. Next, the transparent electroconductive film 46 is adhered through heat and pressure bonding on the transparent electroconductive layer 44 so that the part f at the edge part of the transparent electroconductive layer 44 of the laminated layer sheet 45 becomes exposed, and the electroluminescent element 49 is formed.

[0017]

Next, on the surface of another back surface electrode 51 formed from aluminum foil etc., the reflective insulation layer 52, the electroluminescent layer 53 and the transparent electroconductive layer 54 are successively printed so that the edge part g of the back surface electrode 51 remains, and the layer laminated sheet 55 is formed. Next, at predetermined locations on the transparent electrode 56b of the transparent electroconductive film 56 formed as the transparent electrodes 56 b have been formed on the transparent film 56a, the electricity-collecting band 57 is printed, and the transparent electroconductive film 56 is moved into position and it is adhered through heat and pressure bonding on the transparent electroconductive layer 54 so that the part h at the edge part of the transparent electroconductive film 56 and the part i of the edge part of

the transparent electroconductive layer 54 of the laminated layer sheet 55 are exposed, and the electroluminescent element 59 is formed.

[0018]

Then, on another back surface electrode 61, the reflective insulation layer 62, the electroluminescent layer 63 and the transparent electroconductive layer 64 are successively printed and the laminated layer sheet 65 is formed. Next, at predetermined locations on the transparent electrode 66b of the transparent electroconductive film 66 formed as the transparent electrodes 66 b have been formed on the transparent film 66a, the electricity-collecting band 67 is printed and formed, and the transparent electroconductive film 66 is adhered through heat and pressure bonding on the transparent electroconductive layer 64 so that the part j at the edge part of the transparent electroconductive layer 64 becomes exposed, and the electroluminescent element 69 is formed.

[0019]

Next, as it is shown in the cross sectional view diagram presented in Figure 6, the back surface electrodes 41, 51, 61 of each of the above described electroluminescent elements 49, 59 and 69, are correspondingly electrically connected by the part e and the part g, and also, the part f of the electroluminescent element 49 and the part h of the electroluminescent element 59, and the part i of the electroluminescent element 59 and the part j of the electroluminescent element 69 are placed so that they are electrically connected, and by using the outer cover film 71, which is formed as the thermoplastic resin adhesive layer 71 b has been formed on the surface of the transparent film 71 a, this is sealed from the top and the bottom side by heat and pressure bonding, and the electroluminescent lamp 70 is obtained. In the case according to this practical implementation example, compared to the first practical implementation example, it is possible to reduce the base electroconductive sheet 30 and because of that it is possible to reduce the thickness and also, because of the reduction of the number of the technological processes it is possible to design a cost reduction.

[0020]

Also, according to the present practical implementation example an explanation has been provided of an example where a multiple number of electroluminescent lamps have been connected in a direction parallel to the direction in which the lead electrode has been brought out, however, a connection in a direction that is vertical to the lead out direction of the lead electrode is possible and by that a large scale in both the horizontal and the vertical direction is also possible.

[0021]

[Results From the Present Invention]

In the case according to the present invention, it has a structure where on the transparent electroconductive layer of one element of the adjacent electroluminescent elements the transparent electroconductive layer of another element is layer laminated and because of that it is possible to suggest a large size scale electroluminescent lamp that has a thin form factor and also where there is no connecting parts that are parts that do not generate light, and it is a lamp that can be easily manufactured without using a large size installation. Also, the electrodes on the surface side have a dual layer structure that is formed from the transparent electrodes of the transparent electroconductive film and from the transparent electroconductive layer and because of that and also because of the fact that the transparent electrode and the transparent electroconductive layer are connected through the electricity-collecting band, and that is simple, the electrical connection becomes reliable and it is possible to suggest a large size scale electroluminescent lamp that even in the case of a large size scale has no breaks in the wires and no brightness variation and has high reliability.

[Brief Explanation of the Figures]

[Figure 1]

Figure 1 represents a cross sectional view diagram of a cross section along the line A – A of the electroluminescent lamp according to the first practical implementation example, and it also presents a top view diagram of the same.

[Figure 2]

Figure 2 is an explanation diagram of the structure of each of the electroluminescent elements used in the electroluminescent lamp according to the first practical implementation example and an explanation of its manufacturing technological processes.

[Figure 3]

Figure 3 is an assembly diagram of the electroluminescent lamp according to the first practical implementation example.

[Figure 4]

Figure 4 is a cross sectional view diagram of the electroluminescent lamp according to the second practical implementation example.

[Figure 5]

Figure 5 is an explanation diagram of the structure of each of the electroluminescent elements used in the electroluminescent lamp according to the second practical

implementation example and an explanation of its manufacturing technological processes.

[Figure 6]

Figure 6 is an assembly diagram of the electroluminescent lamp according to the second practical implementation example.

[Figure 7]

Figure 7 is a cross sectional view diagram of the electroluminescent lamp according to the previous technology.

[Figure 8]

Figure 8 is a top view diagram of the large size scale electroluminescent lamp according to the previous technology.

[Explanation of the Symbols]

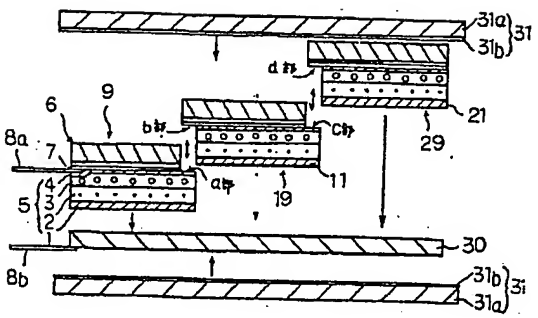
1, 11, 21, 41, 51, 61 .....back surface electrodes
2, 12, 22, 42, 52, 62 .....reflective insulation layer
3, 13, 23, 43, 53, 63 ..... Electroluminescent layer
4, 14, 24, 44, 54, 64 .....transparent electroconductive layer
6, 16, 26, 46, 56, 66 .....transparent electroconductive film
6a, 16a, 26a, 46a, 56a, 66a .....transparent film
6b, 16b, 26b, 46b, 56b, 66b .....transparent electrode
7, 17, 27, 47, 57, 67 .....electricity-collecting band
8a, 8b .....lead electrode
9, 19, 29 ..... electroluminescent element
30.....electroconductive sheet
31, 71.....outer cover film
35..... electroluminescent lamp

Patent Assignee: NEC Kansai LTD.

Translated by Albena Blagev ((651) 735-1461 (h), (651) 704-7946 (w))

10/06/03

【図3】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b
c
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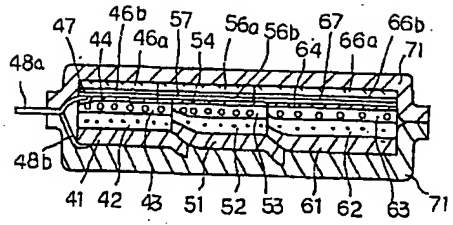
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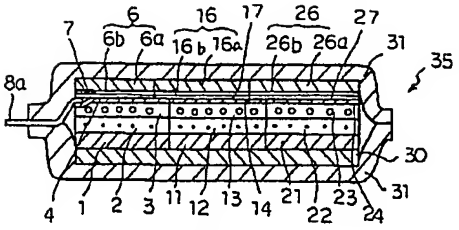
【図1】



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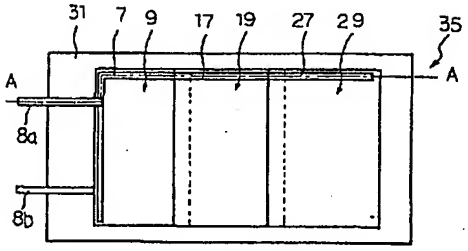
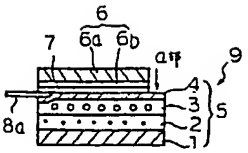
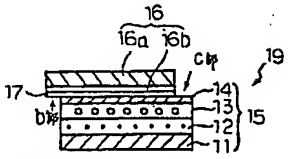


(b)

【図2】



(a)



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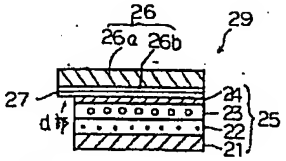
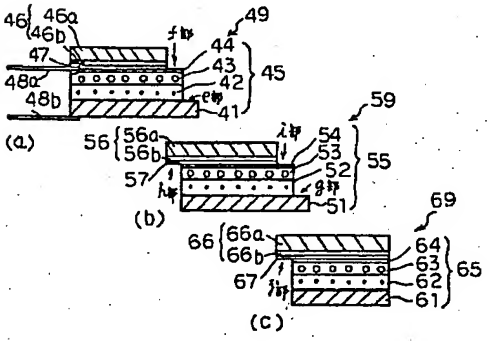


(c)

【図5】



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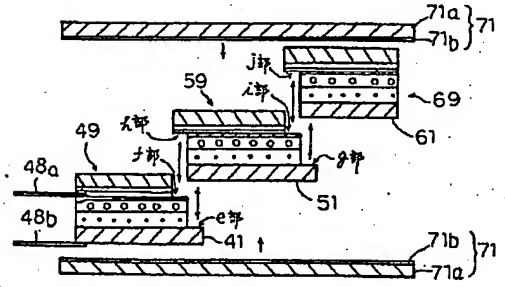

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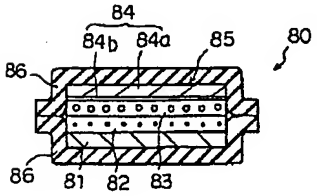
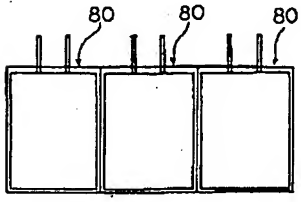
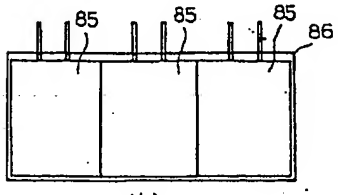


【図8】



(a)



(b)